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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : A61B 17/56 | A1

(11) International Publication Number: WO 97/21389

(43) International Publication Date: 19 June 1997 (19.06.97)

(21) International Application Number: PCT/US96/19099

(22) International Filing Date: 25 November 1996 (25.11.96)

(30) Priority Data:
08/569,918 8 December 1995 (08.12.95) US

(71) Applicant: WRIGHT MEDICAL TECHNOLOGY, INC. [US/US]; 5677 Airline Road, Arlington, TN 38002-9501 (US).

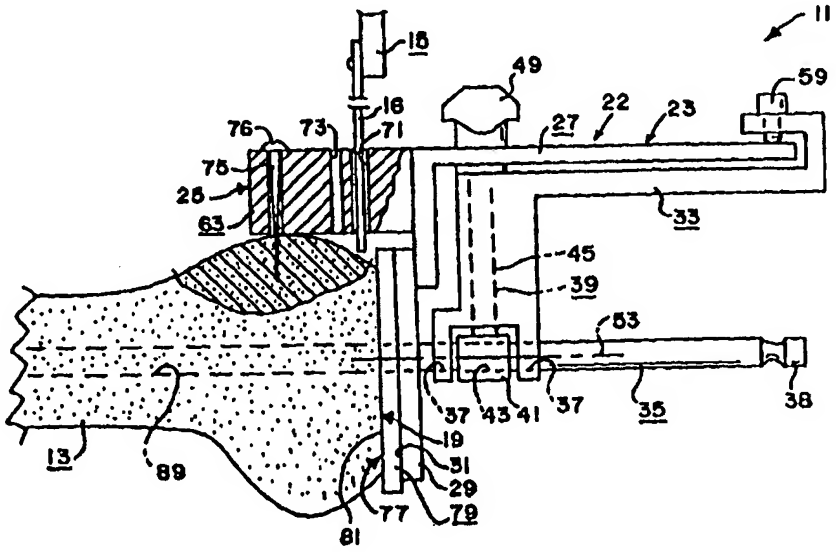
(72) Inventor: WHITE, Stephen, E.; 1750 Beaver Trail, Cordova, TN 38018 (US).

(74) Agents: LONDA, Bruce et al.; Dvorak and Traub, 37th floor, 20 Exchange Place, New York, NY 10005 (US).

(81) Designated States: JP, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: DISTAL FEMORAL RESECTION AND RE-CUT INSTRUMENTATION



(57) Abstract

This invention is an instrumentation for and a method of guiding and performing an accurate distal femoral resection and re-cut. A resection guide (22) is provided with an abutting surface (29) for abutting the distal aspect of a distal femur (18). The resection guide (22) has a distal resection guide member (25) for guiding a bone resection tool to make a distal resection through the end of the distal femur (18) at a distance from the abutting surface (29). A spacer (77) is provided for positioning on the abutting surface (29) of the resection guide (22) after the initial distal resection is made. The spacer (77) has a spacer abutting surface (81) for abutting the distal aspect of the distal femur (18) when the spacer (77) is positioned on the abutting surface (29) of the resection guide (22). The spacer (77) has a thickness so that the effective thickness of the cut will be reduced.

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or necessary, (7) a posterior stabilized cut or cuts to create a cavity for receiving the housing of a posterior stabilized femoral prosthesis.

Surgical techniques and instrumentation for preparing a distal femur to receive a distal implant prosthesis are disclosed in the document, Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™, Wright Medical Technology, Inc. (1993). As disclosed therein, multiple steps are taken to prepare a distal femur to receive a distal femur implant prosthesis. In general, the steps start with preoperative planning to estimate the size of the prosthesis needed by comparing a lateral radiograph of the distal femur with an implant template. The template size that most closely matches the profile of the distal femur on the anterior and posterior aspects is normally chosen. If full length extremity films are available, the appropriate valgus angle may be estimated by the angle formed between the anatomical axis (the longitudinal axis of the femoral shaft) and the mechanical axis (a line extending between the centers of the femoral head, the knee joint, and the ankle joint). The knee joint can then be exposed and a femoral sizing caliper used to confirm the size estimate made during preoperative templating as disclosed at page 5 of the Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™ publication. The femoral sizing caliper there disclosed is extended and placed flush over the distal femur with the posterior aspect of the caliper positioned against the posterior condyles, with the moveable anterior gauge positioned against the anterior cortex, and with the feeler gauge rod positioned parallel to the longitudinal axis of the femoral shaft with its indicator point resting directly on bone that is clear of any tissue. The proper implant size can then be read from the face of the caliper. A distal femoral cut guide is positioned on the distal femur and a distal femoral resection is made using an oscillating saw as disclosed at pages 7-9 of the Total Condylar & Posterior

Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™ publication. The distal femoral cut guide is then removed and an anterior/posterior (A/P) bevel cut guide is seated flush against the distal femoral cut using bone clamps and/or nails, Steinmann pins, etc., and an anterior condyle or flange resection is made using a wide saw blade and the A/P bevel cut guide as disclosed at pages 11-12 of the Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™ publication. A medial anterior bevel resection is made using a wide saw blade and the A/P bevel cut guide as disclosed at pages 11-12 of the Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™ publication. A lateral anterior bevel resection is made using a saw blade and the A/P bevel cut guide as disclosed at pages 11-12 of the Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™ publication. A medial posterior bevel resection is made using a narrow saw blade and the A/P bevel cut guide as disclosed at pages 11-12 of the Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™ publication. A lateral posterior bevel resection is made using the narrow saw blade and the A/P bevel cut guide as disclosed at pages 11-12 of the Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™ publication. A medial posterior condyle resection is made using the narrow saw blade and the A/P bevel cut guide as disclosed at pages 11-12 of the Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™ publication. A lateral posterior condyle resection is made using the narrow saw blade and the A/P bevel cut guide as disclosed at pages 11-12 of the Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™ publication. The A/P bevel cut guide is then removed and a patellar track positioner is fixed to the distal femur to guide a cutting tool, such as a powered patellar track burr, to cut or resect a patellar track groove in the distal femur to accommodate the

recessed patellar track of the final femoral implant prosthesis as disclosed at page 18 of the Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™ publication. If it is desired to implant a posterior stabilized femoral prosthesis, a posterior stabilized endmill guide is secured to the patellar track positioner, a posterior stabilized endmill cutter is then used with the posterior stabilized endmill guide to cut or resect a posterior stabilized cut in the distal femur to accommodate the posterior stabilized housing as disclosed at pages 42-43 of the Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™ publication. A housing punch may be used with the posterior stabilized endmill guide to remove any remaining bone posterior to the endmill cut. Alternatively, a rongeur or saw may also be used after the posterior stabilized endmill guide is removed.

Dunn et al., U.S. Patent 4,759,350, issued July 26, 1988, discloses a system of instruments for preparing a distal femur to receive a distal implant prosthesis. The Dunn et al. system includes a distal femoral cutting guide **65** shown in Figs. 7 and 8 thereof that is mounted to an alignment guide **40** after an anterior femoral cutting guide **55** has been used to cut through the anterior condyles **51** to create a flattened area on the distal femur, and after the anterior femoral cutting guide **55** has been removed from the alignment guide **40**.

Sutherland, U.S. Patent 5,129,909, issued July 14, 1992, discloses an apparatus and method for making precise bone cuts in a distal femur. The Sutherland apparatus and method is used after a femoral cutting block (not shown) has first been used to guide an oscillating saw to accomplish a distal femoral resection by removal or resection of the distal condyles to provide planar surfaces on the distal femoral.

None of these patents or references disclose or suggest the present invention. That is, none of these patents or references disclose or suggest instrumentation

resection guide having a distal resection guide member for guiding a bone resection tool to make a distal resection through the end of the distal femur at a precise distance from the abutting surface; and in which a spacer is provided for positioning on the abutting surface of the resection guide after the initial distal resection is made, the spacer having a spacer abutting surface for abutting the distal aspect or surface of the distal femur when the spacer is positioned on the abutting surface of the resection guide, and having a thickness so that the effective distance from the abutting surface of the resection guide that the distal resection guide member will guide the bone resection tool will be reduced by the thickness of the spacer.

One object of the present invention is to provide instrumentation including a valgus angle alignment guide which fits over a straight intramedullary rod to enable a distal femoral resection and can also be used in combination with a spacer as a distal femoral recut guide.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded perspective view of the distal femoral resection and recut instrumentation of the present invention.

Fig. 2 is a perspective view of the distal femoral resection and recut instrumentation of the present invention.

Fig. 3 is a perspective view of a spacer of the distal femoral resection and recut instrumentation of the present invention.

Fig. 4 is a plan view of the spacer of Fig. 3.

Fig. 5 is an elevational view of the spacer of Fig. 3.

Fig. 6 is a somewhat diagrammatic anterior view of a distal femur having an intramedullary rod implanted therein.

for or a method of accurately resecting a distal femur and then accurately recutting that prior distal femoral resection. More specifically, none of these patents or references disclose or suggest instrumentation for or a method of performing a distal femoral resection in which a spacer having a precise thickness is positioned between an initially resected surface of a distal femur and the abutting surface of a resection guide so that the effective distance from the abutting surface of the resection guide that the resection guide will guide a bone resection tool will be reduced by the precise thickness of the spacer.

SUMMARY OF THE INVENTION

After performing a initial distal femoral resection, it is sometimes necessary or desirable to remove an additional amount of bone from the end of a distal femur (i.e., to perform a distal femoral recut). The present invention provides instrumentation for and a method of guiding and performing an accurate distal femoral resection and then accurately recutting that prior distal femoral resection to remove an additional amount of bone from the end of the distal femur. A basic concept of the present invention is to provide a spacer for placement between the resected surface of a previously resected distal femur and the abutting surface of a distal femoral resection guide or the like to thereby reduce the effective distance from the abutting surface of the resection guide that the distal resection guide member will guide a bone resection tool by the thickness of the spacer.

The present invention comprises, in general, instrumentation for and a method of guiding and performing a distal femoral resection and then recutting that prior distal femoral resection, in which a resection guide is provided with an abutting surface for abutting the distal aspect or surface of a distal femur, the

Fig. 7 is a somewhat diagrammatic lateral view of the distal femur of Fig. 6.

Fig. 8 is a somewhat diagrammatic anterior view of the distal femur of Fig. 6 but showing the distal femoral resection and recut instrumentation of the present invention mounted thereon.

Fig. 9 is a somewhat diagrammatic view of Fig. 8 with portions of the distal femoral resection and recut instrumentation of the present invention broken away for clarity.

Fig. 10 is a somewhat diagrammatic lateral view of the distal femur of Fig. 7 but showing the distal femoral resection and recut instrumentation of the present invention mounted thereon with portions thereof broken away for clarity, and showing a bone resection tool in combination therewith.

Fig. 11 is a somewhat diagrammatic lateral view of the distal femur of Fig. 7 but showing an initial distal femoral cut or resection thereof.

Fig. 12 is a somewhat diagrammatic sectional view of portions of the distal femoral resection and recut instrumentation of the present invention substantially in the arrangement shown in Fig. 8 but with portions broken away for clarity.

Fig. 13 is a somewhat diagrammatic lateral view of the distal femur of Fig. 7 after the initial distal femoral cut or resection thereof and showing the distal femoral resection and recut instrumentation of the present invention being remounted thereon.

Fig. 14 is a somewhat diagrammatic lateral view of the distal femur of Fig. 7 after the initial distal femoral cut or resection thereof and showing the distal femoral resection and recut instrumentation of the present invention mounted thereon with portions thereof broken away for clarity, and showing a bone resection tool in combination therewith.

Fig. 15 is a somewhat diagrammatic lateral view of the distal femur of Fig. 7 after the initial distal

femoral cut or resection thereof and showing a second distal femoral cut or resection thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment of the instrumentation of the present invention is shown generally in Figs. 1-5, 8-10, and 12-15, and identified by the numeral 11. The instrumentation 11 is used in conjunction with a distal femur 13 and a bone resection tool 15 such as a typical oscillating saw or the like having a bone resection member 16 such as a saw blade or the like to make a first or initial distal femoral cut or resection, removing a first thickness or amount of bone 17 from an initial, typically unresected, distal aspect or surface 18 of the distal femur 13 and leaving a typically first resected distal aspect or surface 19 on the distal femur 13, and then, if necessary or desired, to make a typically second distal femoral cut or resection (i.e., a distal femoral recut), removing a second thickness or amount of bone 20 from the distal femur 13 and leaving a second resected distal aspect or surface 21 on the distal femur 13.

The instrumentation 11 includes a resection guide 22 for guiding the bone resection tool 15 to make an accurate initial distal resection to remove a typically first thickness or amount of bone 17 of the distal femur 13. The resection guide 22 includes an abutting surface for initially abutting the initial, typically unresected distal aspect 18 of the distal femur 13, and includes a distal resection guide member for guiding the bone resection tool 15 to make a distal resection through the distal femur 13 at a certain distance from the abutting surface. The specific construction and operation of the resection guide 22 may vary. Thus, for example, the resection guide 22 may be similar to the distal femoral cut guide disclosed at pages 7-9 of the document, Total Condylar & Posterior Stabilized Surgical Technique, ORTHOLOC® ADVANTIM™, Wright Medical Technology, Inc.

(1993), or to the intramedullary alignment guide 40 and distal femoral cutting guide 65 combination shown in Figs. 7 and 8 of Dunn et al., U.S. Patent 4,759,350, issued July 26, 1988. Preferably, however, the resection guide 22 includes a valgus angle alignment guide 23 and a distal femoral resection cross head 25 as more completely described hereinafter.

The valgus angle alignment guide 23 preferably includes a first body member 27 having a paddle 29 with an abutting or contact surface 31 for initially abutting or contacting the initial, typically unresected distal aspect 18 of the distal femur 13, and a second body member 33 pivotally attached to the first body member 27 to allow the valgus angle to be adjusted. The valgus angle alignment guide 23 is designed for use with a straight intramedullary rod 35 and the second body member 33 preferably has a cavity 37 for receiving the distal end 38 of the intramedullary rod 35. The valgus angle alignment guide 23 preferably includes a mechanism for both selectively locking the first and second body members 27, 33 to the intramedullary rod 35 and pivotally attaching the first and second body members 27, 33 together. Thus, the valgus angle alignment guide 23 may include a bolt 39 having a head 41 with a cavity 43 therethrough, and having a shaft 45 with a threaded distal end 47 for coacting with a threaded nut 49. The head 41 can be positioned within a slot in the second body member 33 that divides the cavity 37 into two parts with the cavity 43 in substantial alignment with both parts of the cavity 37 in the second body member 33 so that the distal end 38 of the intramedullary rod 35 can freely slide through the cavity 37 and the cavity 43. The bolt 39 is thus sized and positioned for allowing the distal end 38 of the intramedullary rod 35 to pass through both parts of the cavity 37 in the second body member 33 and through the cavity 43 in the head 41. The shaft 45 extends through a portion of the first body member 27 and a portion of the second body member 33 and

pivotally joins the body members 27, 33 together. When the nut 49 is screwed onto the distal end 47 of the shaft 45 and against the first body member 27, the cavity 43 through the head 41 will be pulled out of alignment with the cavity 37 through the second body member 33 to thereby lock the second body member 33 to the intramedullary rod 35 as will now be apparent to those skilled in the art. The nut 49 is preferably adapted to allow it to be easily tightened by hand, etc. The paddle 29 is preferably shaped and sized so that the abutting surface 31 thereof will typically substantially abut the femoral condyles at the initial, typically unresected distal aspect 18 of the distal femur 13 while allowing the intramedullary rod 35 to pass thereby. Thus, the paddle 29 may be generally U-shaped when viewed from one end, etc.

The valgus angle alignment guide 23 has a mounting mechanism located with respect to the paddle 29 to allow the distal femoral resection cross head 25 to be mounted on the valgus angle alignment guide 23 in a certain, precise relationship to the abutting surface 31 of the paddle 29. The mounting mechanism may consist of a stub or arm-like mounting rod 51 extending from the first body member 27. The first and second body members 27, 33 can be pivoted relative to one another about the shaft 45 of the bolt 39 so as to vary the angle 54 (see Fig. 12) between a longitudinal axis 53 extending through the cavity 37 of the second body member 33 which corresponds to the longitudinal axis of the intramedullary rod 35, and the longitudinal axis 55 of the mounting rod 51 which corresponds to an axis perpendicular to the plane of the abutting surface 31 of the paddle 29. That angle 54 represents or is related to the valgus angle which may be estimated by the angle formed between then anatomical axis of the femoral shaft and the mechanical axis between the centers of the femoral head, knee and angle joints. The valgus angle alignment guide 23 may include indicia 57 for indicating the relative angle 54 between the

longitudinal axis 53 and the longitudinal axis 55, etc. The indicia 57 may include spaced markings or grooves on the first body member 27 and a finger-like pointer or the like on the second body member 33 arranged and located to point to the marking or groove on the first body member 27 that corresponds to the set relative angle 54 between the longitudinal axis 53 and the longitudinal axis 55, etc. The valgus angle alignment guide 23 may include a lock screw 59 or the like for locking the first and second body members 27, 33 in a certain valgus angle. The lock screw 59 may include a threaded shaft for screwing through a threaded aperture in the second body member 33 and against the first body member 27, and may include an enlarged head for allowing the threaded shaft to be easily turned, etc. In addition, the valgus angle alignment guide 23 may include one or more typical ball-and-detent type holding means for providing a resistance-type indication when the relative angle 54 between the longitudinal axis 53 and the longitudinal axis 55 is a certain predetermined degree such as, for example, +/- 3°, 5°, or 7° as will now be apparent to those skilled in the art.

The distal femoral resection cross head 25 preferably includes a body member 63 having an aperture 65 therethrough for receiving the mounting rod 51 of the first body member 27 of the valgus angle alignment guide 23 to allow the body member 63 to be accurately and positively attached to the valgus angle alignment guide 23. The shape or contour of the aperture 65 as taken on a transverse plane is preferably substantially square. Likewise, the cross sectional shape or contour of the mounting rod 51 as taken on a transverse plane is preferably substantially square and sized to mate with the aperture 65 so that the body member 63 can be accurately and positively positioned thereon. The distal femoral resection cross head 25 preferably includes one or more typical ball-and-detent type holding means for providing a resistance-type attachment of the body member

63 to the mounting rod 51 as will now be apparent to those skilled in the art. The mounting rod 51 preferably has one or more detents or slots forming the detent portion of the ball-and-detent type holding means to hold the distal femoral resection cross head 25 in position on the valgus angle alignment guide 23.

The distal femoral resection cross head 25 preferably includes structure for guiding the bone resection tool 15 to make distal resections through the distal femur 13. More specifically, the body member 63 of the distal femoral resection cross head 25 may have at least one and preferably a first slot 71 and a second slot 73 therethrough for guiding the bone resection tool 15 such as a saw blade of an oscillating saw to make a precise, planar distal femoral resection through the distal femur 13. The slots 71, 73 are carefully located as to be exactly parallel to and spaced a precise distance from the abutting surface 31 of the paddle 29 of the first body member 27 of the valgus angle alignment guide 23 when the distal femoral resection cross head 25 is mounted in position on the valgus angle alignment guide 23. Thus, for example, the first slot 71 may be spaced 8 millimeters from the abutting surface 31 of the paddle 29 of the first body member 27 of the valgus angle alignment guide 23 when the distal femoral resection cross head 25 is mounted in position on the valgus angle alignment guide 23, and the second slot 73 may be spaced an additional 3 millimeters (i.e., a total of 11 millimeters) from the abutting surface 31 of the paddle 29 of the first body member 27 of the valgus angle alignment guide 23 when the distal femoral resection cross head 25 is mounted in position on the valgus angle alignment guide 23.

The body member 63 may have a plurality of apertures 75 therethrough for allowing pins 76 or the like to be used to pin the distal femoral resection cross head 25 to the distal femur 13 after it has been properly positioned on the distal femur 13.

The instrumentation 11 includes a spacer 77 for being positioned on the abutting surface 31 of the paddle 29 of the first body member 27 of the valgus angle alignment guide 23 of the resection guide 22. The spacer 77 has a body member 79 with a spacer abutting surface 81 on one side thereof for abutting the distal aspect of the distal femur 13 when the spacer 77 is positioned on the abutting surface 31 of the paddle 29. The spacer 77 has a precise thickness to reduce the effective precise distance from the abutting surface 31 of the paddle 29 that the resection guide 22 guides the bone resection tool 15 by the precise thickness of the spacer 77. The side 83 of the body member 79 opposite the spacer abutting surface 81 is designed to abut and be attached to the abutting surface 31 of the paddle 29. More specifically, the side 83 of the body member 79 may include a plurality of male snap means 85 for being pressed into cavities or apertures 87 in the abutting surface 31 of the paddle 29 to thereby removably attach the spacer 77 to the abutting surface 31 of the paddle 29. The spacer 77 is preferably substantially identical in plan to the paddle 29 and, thus, is preferably generally U-shaped when viewed from one end, etc. The thickness of the spacer 77 may vary. However, for a resection guide 22 as described above with guide slots 71, 73 spaced 8 and 11 millimeters, respectively, from the abutting surface 31 of the paddle 29, the spacer 77 may have a thickness of 5 millimeters to provide a recut thickness of 3 and 6 millimeters, respectively.

The preferred method of performing a distal femoral resection of the present invention preferably starts with standard preoperative planning to estimate the size of the prosthesis to be implanted by, for example, comparing lateral radiographs of the distal femur with implant templates, etc. The template size that most closely matches the profile of the distal femur 13 on the anterior and posterior aspect is normally chosen. In

order to maintain proper quadriceps tension in flexion and extension, the patellar flange should not be radically shifted either anteriorly or posteriorly. During surgery, the prosthesis size estimate should be confirmed using appropriate femoral sizing instrumentation. The knee joint can then be exposed using a long anterior skin incision and medical parapatellar incision or the like. Any osteophytes should be removed from the intercondylar notch area of the distal femur 13 with a rongeur or the like to provide a clear view of the walls and roof of the intercondylar notch. An intramedullary cavity 89 can then be prepared in the distal femur 13, preferably with an entry point in the deepest point of the patellar groove just anterior to the cortical roof of the intercondylar notch. The intramedullary cavity 89 can be started with a pilot point drill and then finished with a intramedullary reamer or combination intramedullary reamer and intramedullary rod. In any event, an intramedullary rod 35 is mounted in the intramedullary cavity 89 with the distal end 38 of the intramedullary rod 35 extending outward from the distal femur 13. With both the nut 49 and the lock screw 59 loose to allow easy movement and adjustment, the femoral valgus alignment guide 23 is then assembled on the distal end 38 of the intramedullary rod 35 by inserting the cavity 37 in the second body member 33 and the cavity 43 through the head 41 of the bolt 39 over the distal end 38 of the intramedullary rod 35, and moving the first body member 27 proximally until the abutting surface 31 of the paddle 29 abuts the unresected distal condyles. The valgus angle should then be set. If full length extremity radiographs or films are available, the appropriate valgus angle may be estimated by the angle formed between the anatomical axis (the longitudinal axis of the femoral shaft) and the mechanical axis (a line extending through the centers of the femoral head, knee joint and angle joint). The valgus angle may also be determined by using an external

alignment rod or the like. The valgus angle is set by pivoting the first and second body members 27, 33 relative to one another about the shaft 45 of the bolt 39 until the indicia 57 of the valgus angle alignment guide 23 indicates the desired valgus angle (i.e., the relative angle 54 between the longitudinal axis 53 and the longitudinal axis 55, etc.). Once that relative angle 54 is set, the lock screw 59 is tightened to lock the first and second body members 27, 33 in that relative angle 54. After it is determined that the abutting surface 31 of the paddle 29 is abutting the unresected distal condyles, the nut 49 is tightened to lock the valgus angle alignment guide 23 to the intramedullary rod 35. The distal femoral resection cross head 25 can then be mounted on the valgus angle alignment guide 23 by merely inserting the aperture 65 through the body member 63 of the distal femoral resection cross head 25 over the mounting rod 51 of the first body member 27 of the valgus angle alignment guide 23 and then securing the distal femoral resection cross head 25 to the valgus angle alignment guide 23 using, for example, a typical ball-and-detent type holding means or the like. Optionally, the distal femoral resection cross head 25 could be mounted on the valgus angle alignment guide 23 before the valgus angle alignment guide 23 is assembled on the intramedullary rod 35, or could even be constructed as a fixed, integral, one-piece unit with the valgus angle alignment guide 23, etc. The distal femoral resection cross head 25 can then be securely pinned to the distal femur 13 by inserting headless bone pins 76 or the like through the apertures 75 in the body member 63 and into the distal femur 13. The valgus angle alignment guide 23 and intramedullary rod 35 can then be removed if desired. Leaving the valgus angle alignment guide 23 and intramedullary rod 35 in place provides additional stability. The first distal femoral resection is then made with the bone resection tool 15 (e.g., with an oscillating saw with a 1.25 millimeter thick saw blade)

by inserting the bone resection member 16, etc., through the appropriate slot 71, 73 in the body member 63 of the distal femoral resection cross head 25 and passing the blade, etc., through the distal femur 13. Whether to use the first or second slot 71, 73 for a guide depends on how much bone the surgeon elects to resect from the distal femur 13. Thus, using the dimensions given as examples hereinabove, using the first slot 71 as a guide will result in a resection that is 8 millimeters thick while using the second slot 73 as a guide will result in a resection that is 11 millimeters thick. The thickness or amount of bone to be resected from the distal femur 13 should, in general, be substantially equal to the thickness to be replaced by the distal condyles of the implant unless special ligament problems, etc., dictate otherwise. For example, a significant flexion contracture may require one to three millimeters of additional distal femoral resection, while recurvatum may require one to three millimeters less distal femoral resection. Once the first distal femoral resection has been completed, the resection guide 22 can be removed from the distal femur 13 and various additional resections or cuts can be made including, for example, an anterior flange or condylar cut, an anterior bevel cut or cuts, a posterior cut or cuts, a posterior bevel cut or cuts, a patellar track groove cut, a posterior stabilized cut, etc., to prepare the distal femur 13 to receive a trial prosthesis. The proximal end of the tibia may also be prepared in any standard manner to receive a trial prosthesis. Once the trial prostheses have been implanted, a trial reduction of the knee joint may be performed.

If the trial reduction indicated that the knee joint is too tight, etc., or if the surgeon otherwise decides to remove an additional thickness of bone from the distal femur 13, the intramedullary rod 35 is again properly positioned within the intramedullary cavity 89 in the distal femur 13 and the femoral valgus alignment guide 23 is again assembled on the distal end 38 of the

intramedullary rod 35. The spacer 77 is snapped onto the abutting surface 31 of the paddle 29 or otherwise positioned between the abutting surface 31 of the paddle 29 and the distal aspect of the distal femur 13 and the femoral valgus alignment guide 23 is moved proximally until the abutting surface 81 of the spacer firmly abuts the first resected distal aspect 19 of the distal femur 13. With the valgus angle 54 set as above discussed and after it is determined that the abutting surface 31 of the paddle 29 is abutting the side 82 of the spacer 77 and that the spacer abutting surface 81 is abutting the first resected distal aspect 19 of the distal femur 13, the valgus angle alignment guide 23 can again be locked to the intramedullary rod 35 and the distal femoral resection cross head 25 can again be securely pinned to the distal femur 13 by inserting headless bone pins 76 or the like through the apertures 75 in the body member 63 and into the distal femur 13. As discussed above, the valgus angle alignment guide 23 and intramedullary rod 35 can then be removed if desired. The second distal femoral resection is then made with the bone resection tool 15 (e.g., with an oscillating saw with a 1.25 millimeter thick saw blade) by inserting the bone resection member 16 (e.g., the saw blade), through the appropriate slot 71, 73 in the body member 63 of the distal femoral resection cross head 25 and passing the blade, etc., through the distal femur 13. Whether to use the first or second slot 71, 73 for a guide depends on how much additional bone the surgeon elects to resect from the distal femur 13. That is, using the dimensions given as examples hereinabove, if the surgeon would like to remove an additional three millimeters from the distal femur 13, the first slot 71 in the body member 63 should be used to guide the bone resection tool 15. However, if the surgeon would like to remove an additional six millimeters from the distal femur 13, the second slot 73 in the body member 63 should be used to guide the bone resection tool 15. A second trial reduction can be performed and once

the surgeon is satisfied, the final prostheses are implanted and the knee is closed in the usual manner.

Although the present invention has been described and illustrated with respect to a preferred embodiment and a preferred use therefor, it is not to be so limited since modifications and changes can be made therein which are within the full intended scope of the invention.

I Claim:

1. Instrumentation for guiding a bone resection tool to make a distal femoral resection and then to make a distal femoral recut; said instrumentation comprising:

(a) a resection guide including an abutting surface for abutting the distal aspect of a distal femur, and including a distal resection guide member for guiding the bone resection tool to make a distal femoral resection through the end of the distal femur at a distance from said abutting surface; and

(b) a spacer for positioning on said abutting surface of said resection guide, said spacer having a spacer abutting surface for abutting the distal aspect of the distal femur when said spacer is positioned on said abutting surface of said resection guide, said spacer having a thickness so that the effective distance from said abutting surface of said resection guide that said distal resection guide member will guide the bone resection tool will be reduced by the thickness of said spacer.

2. The instrumentation of claim 1 in which said spacer includes attachment means for attachment to said resection guide.

3. The instrumentation of claim 1 in which said abutting surface of said resection guide has a plurality of cavities therein; and in which said spacer includes attachment means for engaging cavities in said abutting surface of said resection guide and for attaching said spacer to said resection guide.

4. Instrumentation for guiding a bone resection tool to make a distal femoral resection and then to make a distal femoral recut; said instrumentation comprising:

(a) a valgus angle alignment guide including an abutting surface for abutting the distal aspect of a

distal femur;

(b) a distal resection guide member for attachment to said valgus angle alignment guide and for guiding the bone resection tool to make a distal femoral resection through the end of the distal femur at a precise distance from said abutting surface of said valgus angle alignment guide; and

(c) a spacer for attachment to said abutting surface of said valgus angle alignment guide, said spacer having a spacer abutting surface for abutting the distal aspect of the distal femur when said spacer is attached to said abutting surface of said valgus angle alignment guide, said spacer having a precise thickness so that the effective precise distance from said abutting surface of said valgus angle alignment guide that said distal resection guide member will guide the bone resection tool will be reduced by the precise thickness of said spacer.

FIG. 1

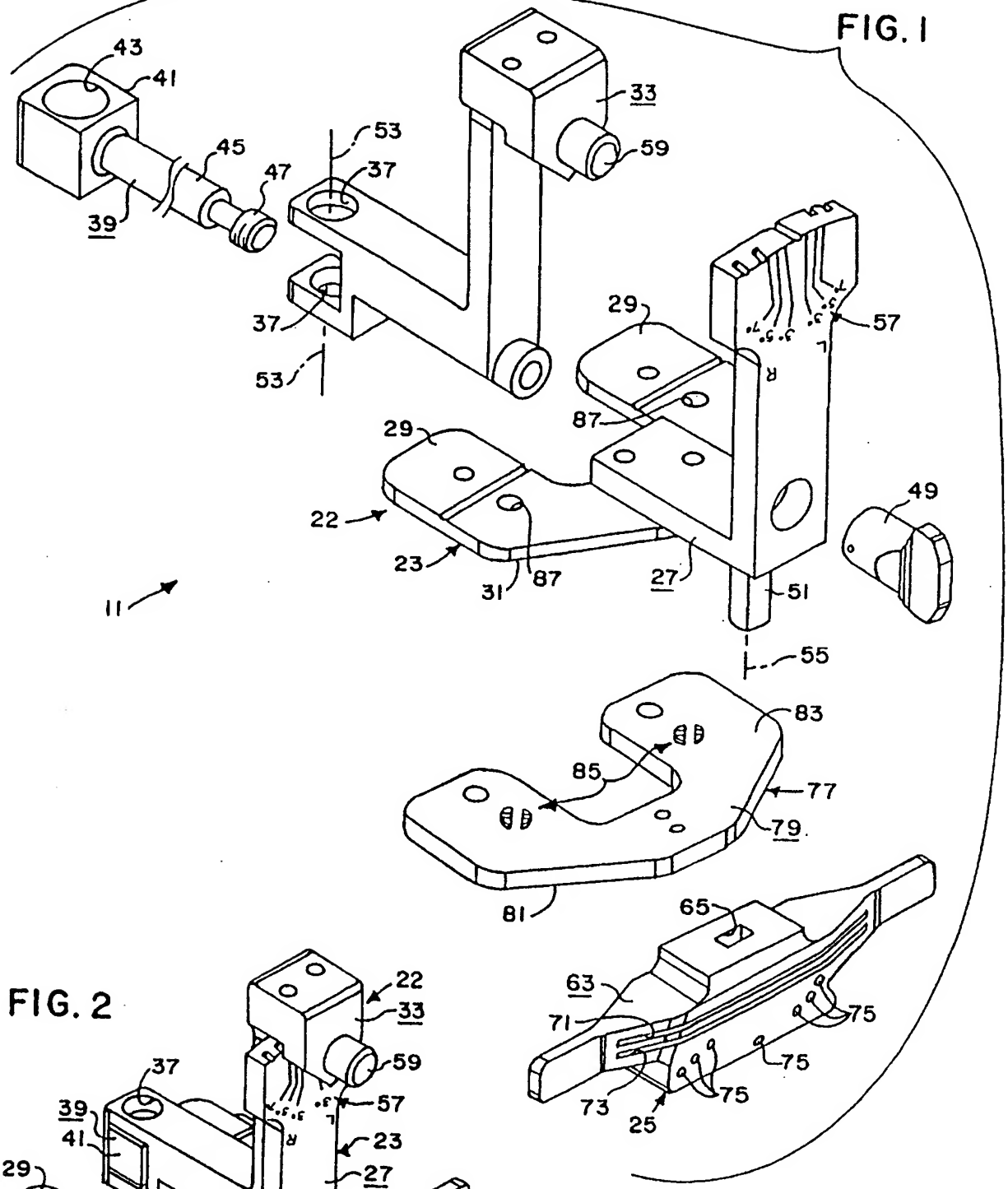
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FIG. 2

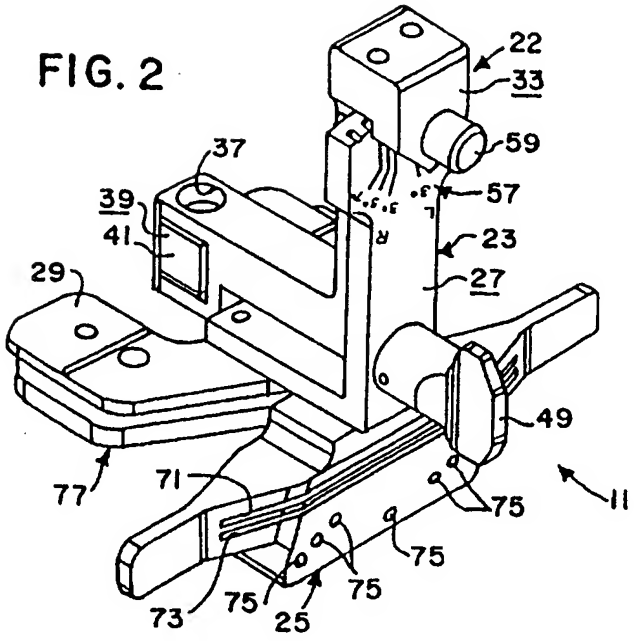
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FIG. 3

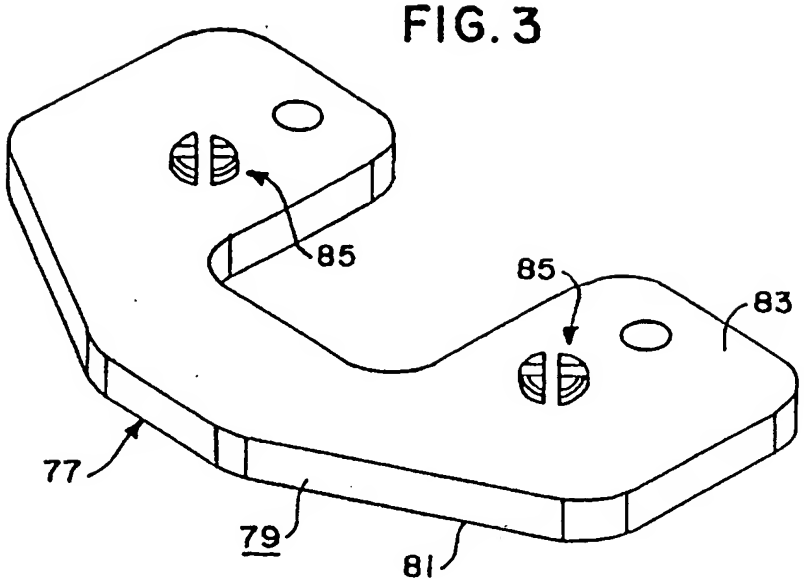


FIG. 4

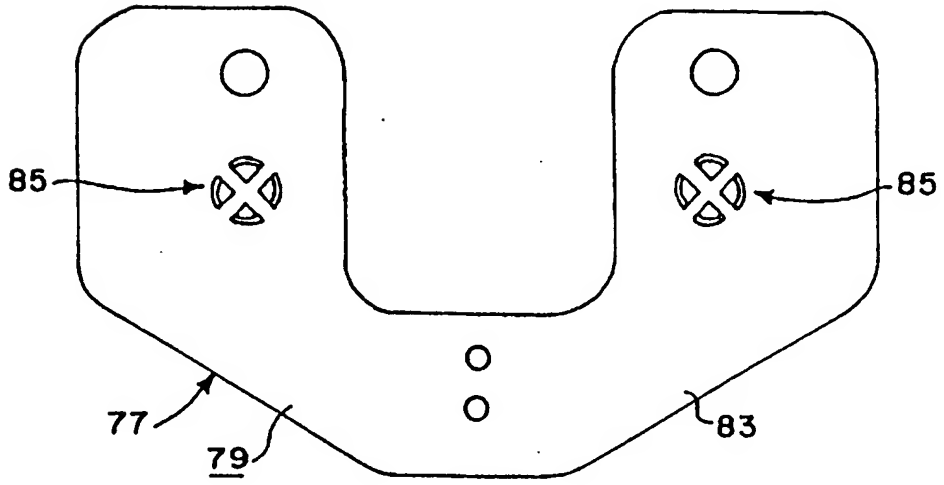


FIG. 5

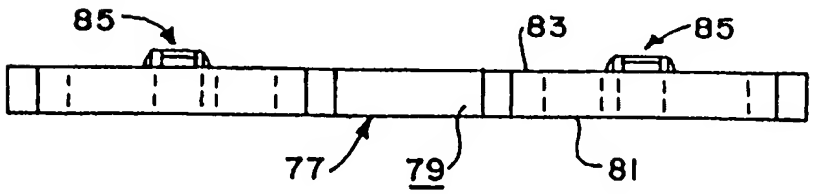


FIG. 6

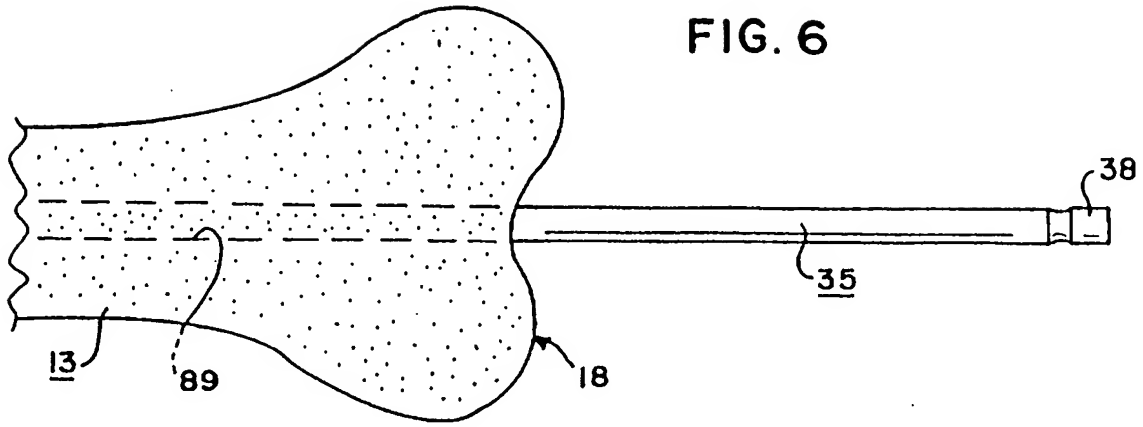


FIG. 7

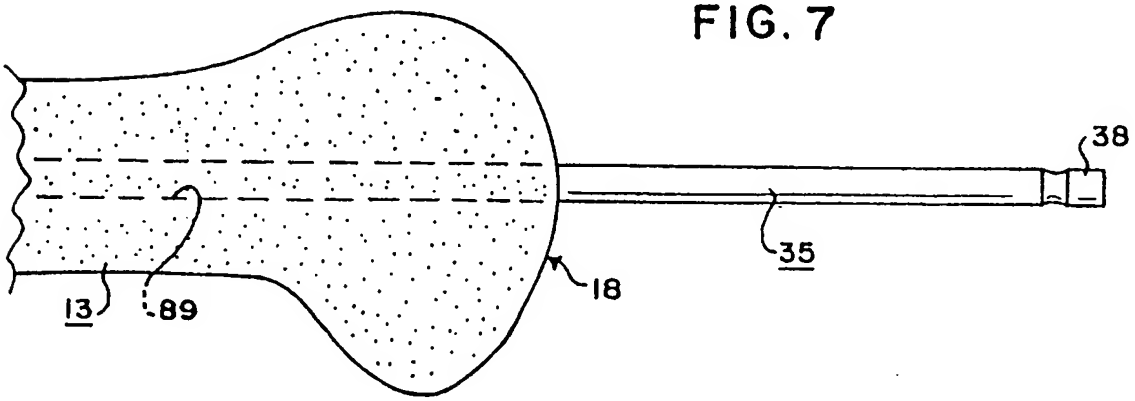


FIG. 8

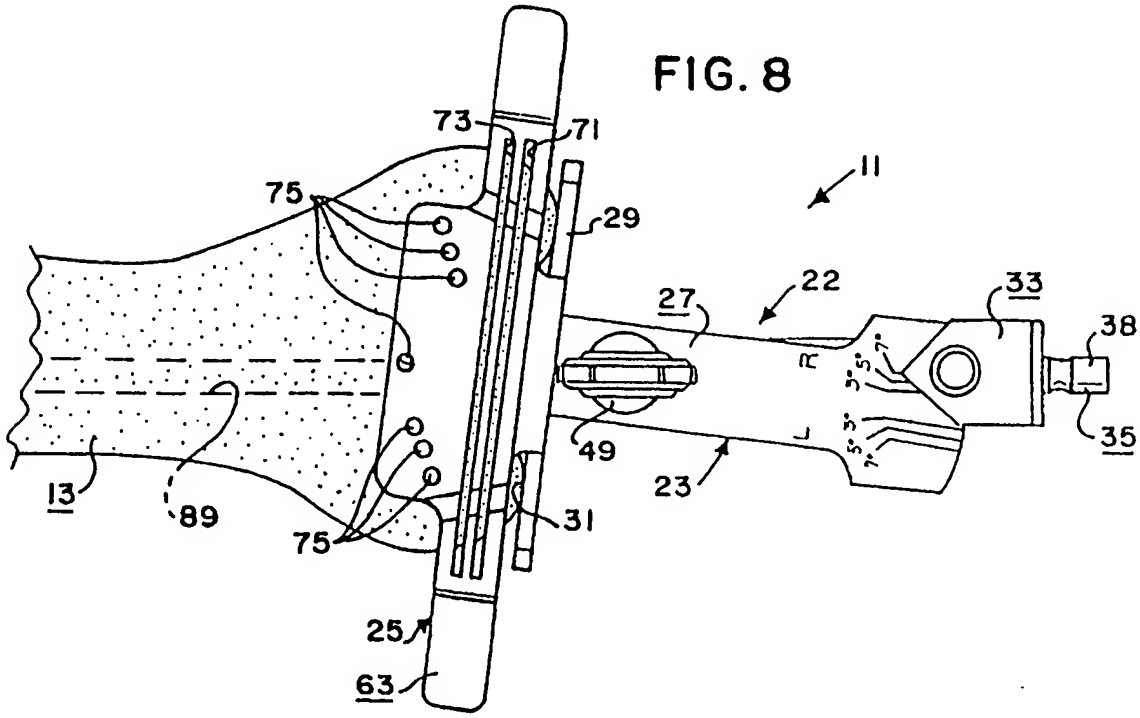


FIG. 9

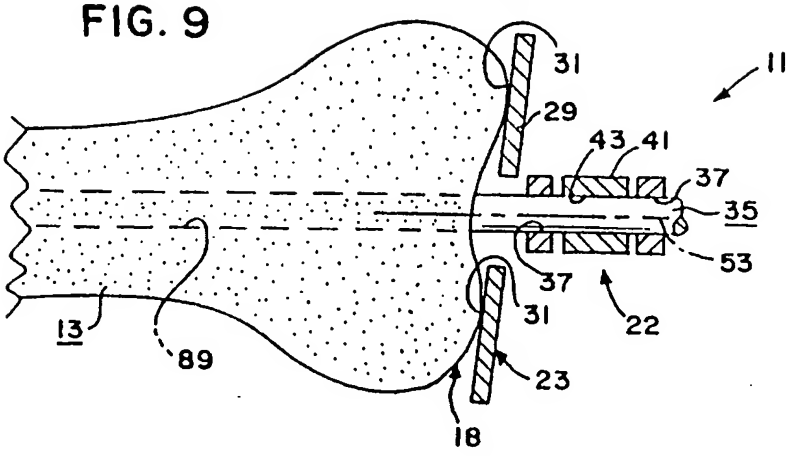


FIG. 10

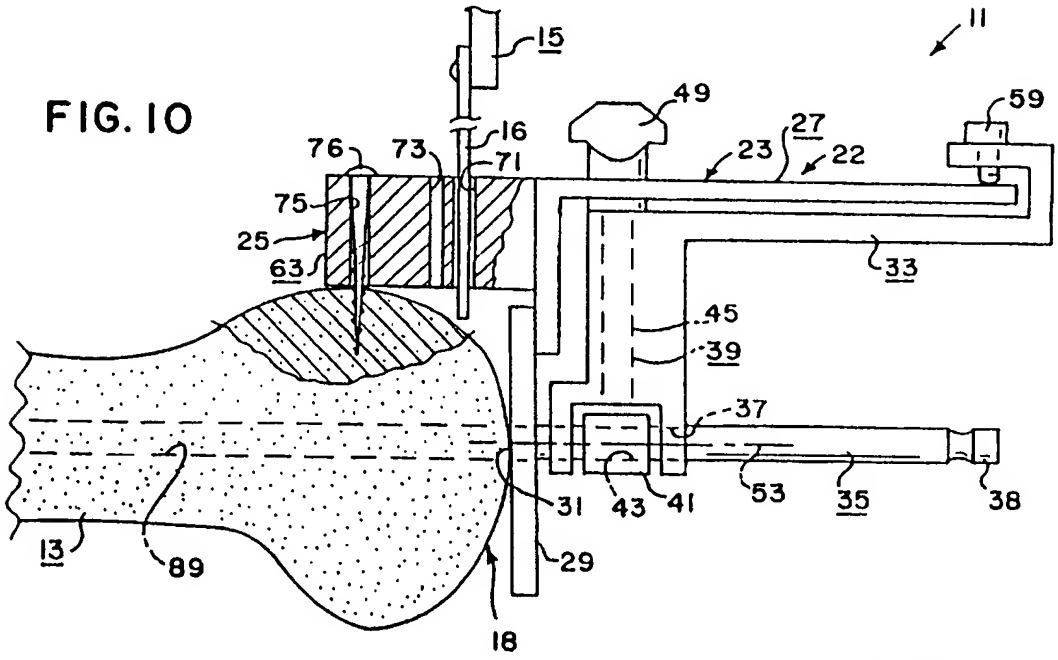


FIG. 11

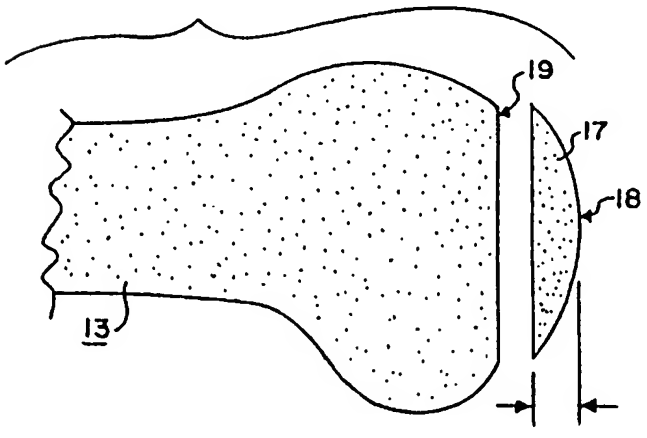


FIG. 12

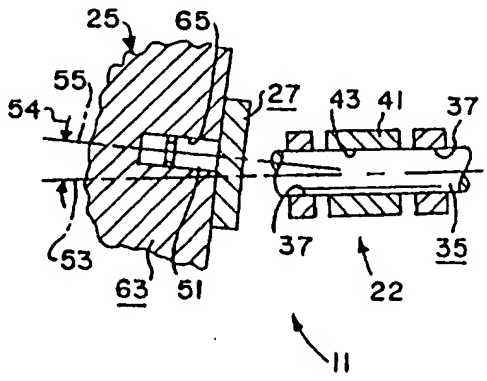


FIG. 13

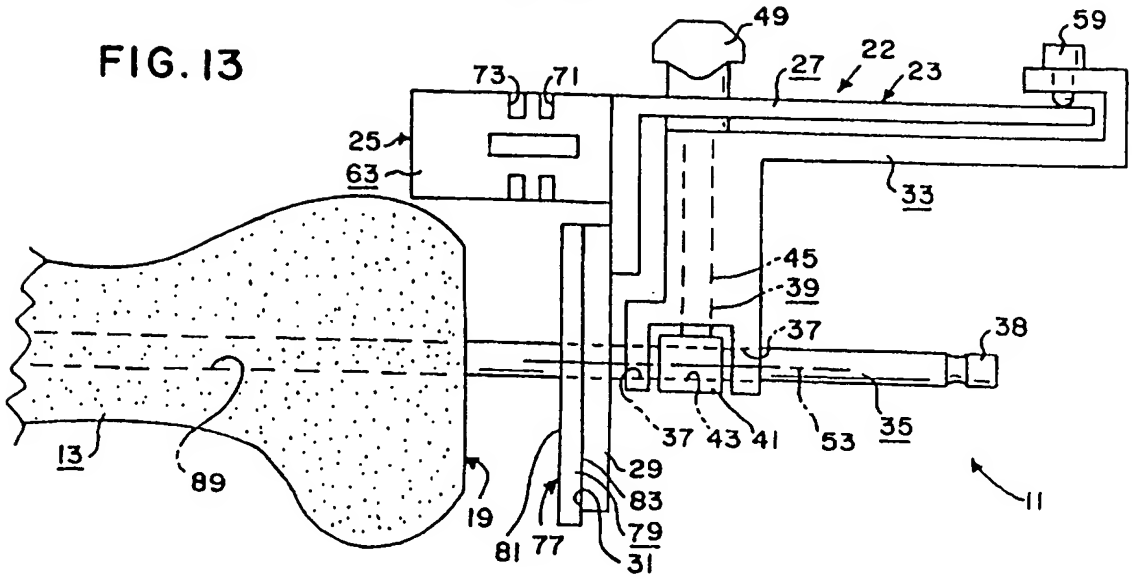


FIG. 14

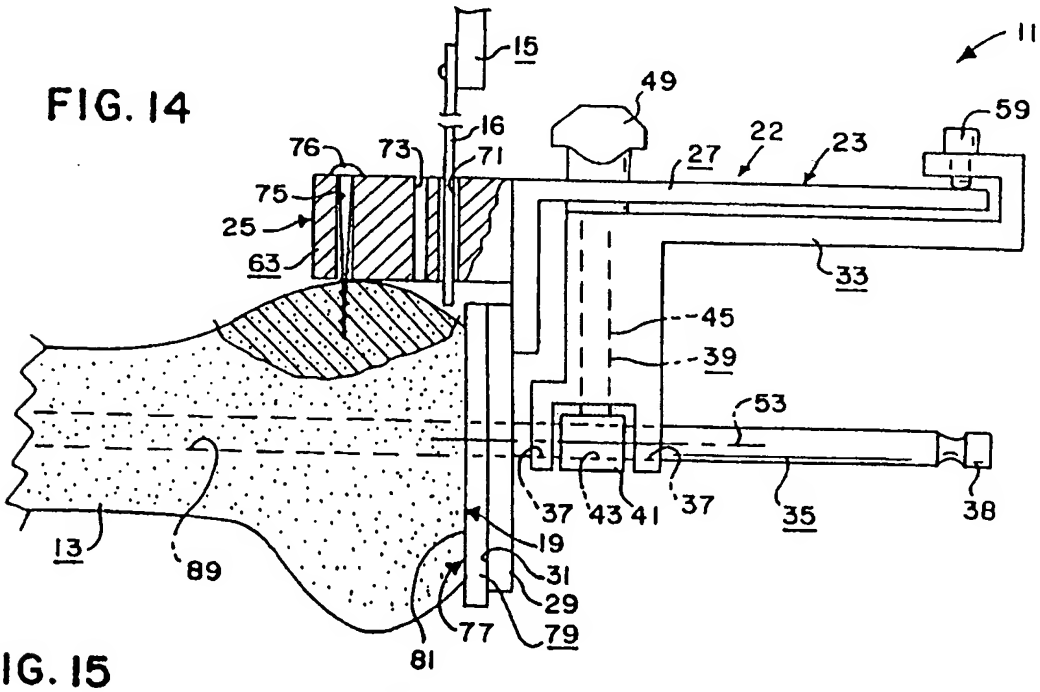
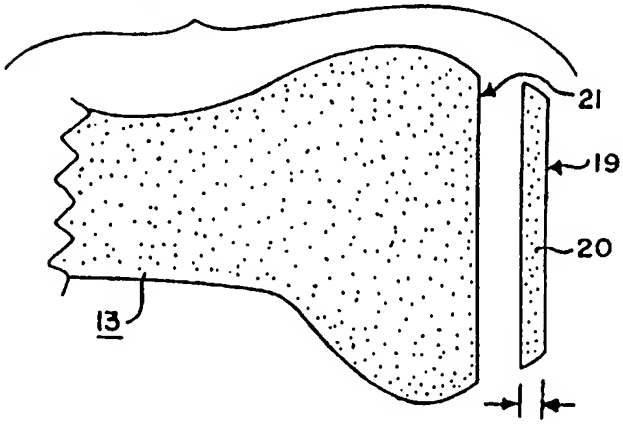


FIG. 15



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/19099

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A61B 17/56
US CL :606/88

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 606/70, 80, 82, 86-88, 102

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US, A, 5,486,178 A (HODGE) 23 January 1996, Figs. 4 and 5.	1-4
A,P	US, A, 5,562,674 A (STALCUP et al) 08 October 1996, entire reference.	4

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 01 FEBRUARY 1997	Date of mailing of the international search report 19FEB1997
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3590	Authorized officer Diane Smith for GUY TUCKER Telephone No. (703) 308-3271

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